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CLIMATIC INFLUENCES ON AMERICAN ARCHITECTURE

By Dr. ANDREW H. PALMER

FELLOW, AMERICAN GEOGRAPHICAL SOCIETY

FROM time immemorial man has been interested in the weather, primarily because of its influence upon those things which support and sustain him—his field-crops, his fruit-trees and his cattle. Only within recent years, however, has a new emphasis been placed upon climate in that it has been studied from the point of view of its influence upon man himself. In approaching the element of climate as an influence on man, his immediate environment and his daily activities, a new and interesting vista is presented to view.

During the centuries when man was a wanderer on the face of the earth, he naturally found it to his advantage to remain in regions where the climate was hospitable. He did not long remain in inhospitable climates until he had learned to construct a shelter, and thus to provide an artificial climate, when that was needed. These shelters, crude and rudimentary at first, complex and variegated later, form in their evolution a parallel with the evolution of man himself. In fact, in the narrative of man's evolution, the chapter describing his domicile is not less important than those concerned with his literature and his art.

Additional centuries passed between the time man ceased to be a nomad and the time when he possessed a well-defined architecture. In the beginning, architecture was necessarily domestic, in that it was entirely concerned with a house as a dwelling-place. As civilization advanced, the field of architecture grew to embrace structures like the temple, the market-place and the coliseum. Moreover, races and periods developed systems peculiarly their own. As a result, we now recognize distinct features of architecture when we refer to the Gothic, the Romanesque, the Byzantine, the Egyptian, the Persian, or the Mohammedan. Since the beginning of the nineteenth century, however, we have a unique situation in that there is no universal or generally prevalent style. While this is true of the Old World generally, it is even more true of the New World.

We have no well-defined American architecture. Like many other things American, we can not speak of this in the singular. We have American climates and American architectures.

Numerous causes contribute to the great variety in building design in the United States. For a given type of building the more important considerations which determine the design are the natural environment and the building material available. Climate may properly be considered as a phase of the natural environment. As an influence in determining the design of large structures like hotels, office-buildings and apartment houses, climate is a subordinate consideration. Seattle office-buildings resemble those of New York, and San Francisco hotels are not greatly unlike those of Boston. In the domain of domestic architecture, however, that concerned with a detached building used as a dwelling-place, climate is a dominating influence. In the construction of our homes we have learned to adapt ourselves to our environment. Just as climate differs greatly in the various parts of the United States, so the type of home construction also differs. When design is left to the skilled architect rather than to a blundering mason or carpenter, results tell the tale. In this age of efficiency it pays to consult the specialist. Moreover, the technical-architect is in greater demand to-day than is the artist-architect. In home construction practical needs are more important than esthetic considerations, and comfort is preferred to display. Climate as a phase of natural environment determines the practical needs in no small measure. An enumeration of some of the climatic influences upon home design in the United States will be given in the following.

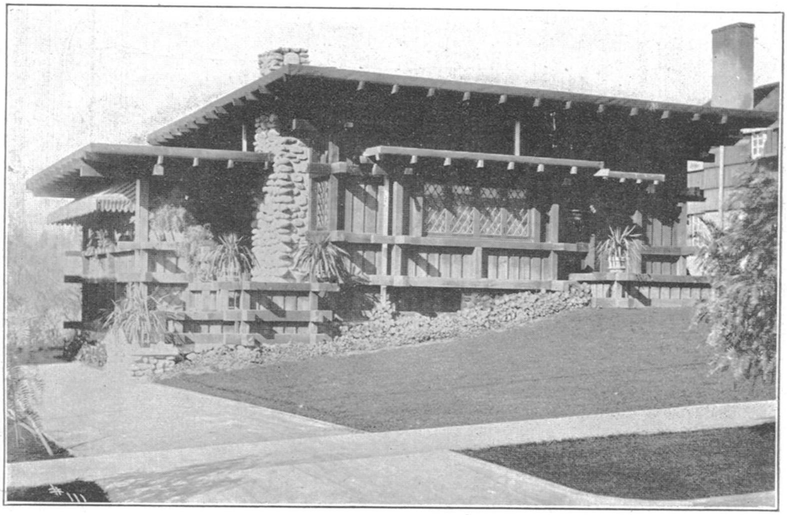
INDOOR AND OUTDOOR CLIMATES CONTRASTED

People live in houses partly because of the fact that there one can regulate the climate of his immediate environment. Indoor climate is therefore essentially artificial, as contrasted with outdoor climate. The advantages of such an artificial climate are principally those of agreeable temperatures having a small range, and shelter from precipitation (rain, snow, sleet, etc.), from wind and from the sun. But there are certain disadvantages not so easily recognized. Only a few will be mentioned at this point. Even in modern dwellings having the most improved ventilating systems, the air is not as well adapted for breathing purposes as is that in the open. Moreover, during the half-year when our homes are artificially heated the humidity of the air indoors is usually too low for our needs. When out-door air is introduced into our houses through ventilation, and is then heated to a comfortable living temperature, its relative humidity is reduced unless water is added through evaporation. While dryness in the air is not of itself harmful, the individual passing quickly from air of moderately high relative humidity outdoors to relatively dry air indoors, or *vice versa,* is subjected to a greater change than the delicate membranes of his nose, throat and lungs can endure without injury. The result is nasal or bronchial catarrh. It is only a comparatively short time that the serious effects of deficient indoor humidity have been recognized, and thus far no device has been generally adopted to offset them. A fortune awaits the man who will invent and place upon the market a simple, inexpensive and unobtrusive humidifier. Thus far house plants and evaporating trays have proved partially effective in combating this evil. Other factors contribute to the unfavorable features of indoor climate, but those mentioned are the most important. Incidentally it may be stated that most of our rooms are kept too warm in winter. There seems to be a universal feeling that 70° F. is the correct temperature for the air in a living-room. But it has been shown repeatedly by various investigators that mental work is done to best advantage in temperatures nearer 60° F., and manual work at temperatures not much above 55° F. With the proper relative humidity, 60°–65° F. is a comfortable temperature for a living-room.

Contrasted with the artificial indoor climate, the outdoor natural climate presents many points of difference. As a result of modern scientific research it has already become a proverb that "no healthy organism is hurt by exposure to sunlight and the open air." Given proper clothing and freedom of movement, man can live out of doors over the larger part of the globe. One of the curious lessons taught by the Great War is the fact that throughout a large part of Europe man can live out of doors in winter as well as in summer. It is related that countless soldiers who formerly lived an in-door life have improved in health by spending a winter out of doors in the trenches. Modern cures for pulmonary tuberculosis are based largely upon the beneficial effects of out-door living. In Florida and in the Southwest, many people, both well and ill, live out of doors throughout the year. Moreover, few people "catch cold" while out of doors. The most frequent causes of colds are contaminated air, sudden temperature changes and draughts. Outside an enclosure the air is never contaminated, and draughts out of doors are harmless to the person in good health.

CLIMATIC INFLUENCES ON AMERICAN HOME DESIGN

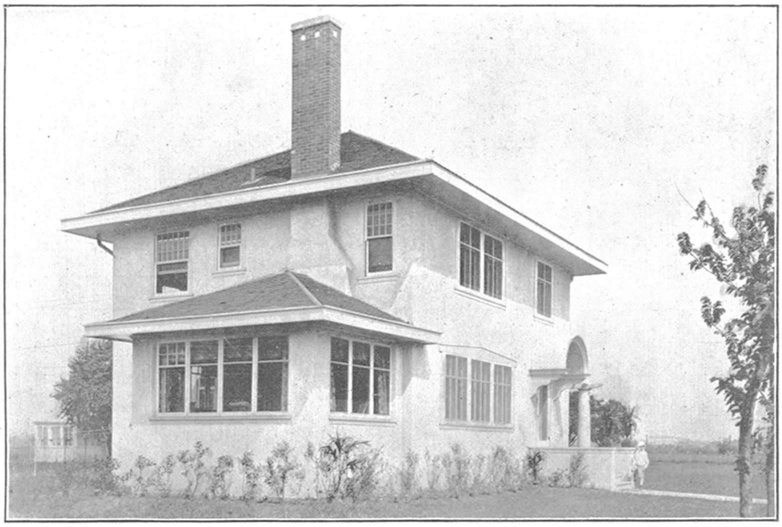
A large proportion of the American people now live in crowded conditions in the apartments and tenements of great cities. But the home which is generally considered the typical American home is that of a detached wooden, brick or concrete house, of five to ten rooms, two to three stories in height, surrounded by a yard containing lawn and garden, and situated in a small town or in the suburbs of a large city. Strictly from a climatic standpoint, wood for construction purposes has the advantages of being a non-conductor of heat, and when painted is nonporous. However, it has the disadvantage of being insecure in a strong wind. Brick has all the advantages of wood, and is more secure in the time of storm. Concrete, the use of which is increasing rapidly from year to year, has the one serious disadvantage that it is porous, and admits moisture in humid climates. However, with the use of various preparations now on the market it can be made water-tight.



Courtesy of *The National Builder.*

A LOS ANGELES BUNGALOW. The veranda shown at the left of the picture serves as a living room which can be used throughout the year.

With reference to the size of the house, climate is considered by the architect because in winter it takes more fuel to heat a large house than a small one, while in summer a large house is kept cool more easily than a small one. For this reason the North Dakota cottage is usually small compared with



Courtesy of *The National Builder.*

A MODERN CONCRETE DWELLING IN EVANSTON, ILLINOIS. The sun-parlor shown in the foreground is on the south side of the building, and therefore receives the maximum possible amount of sunshine.

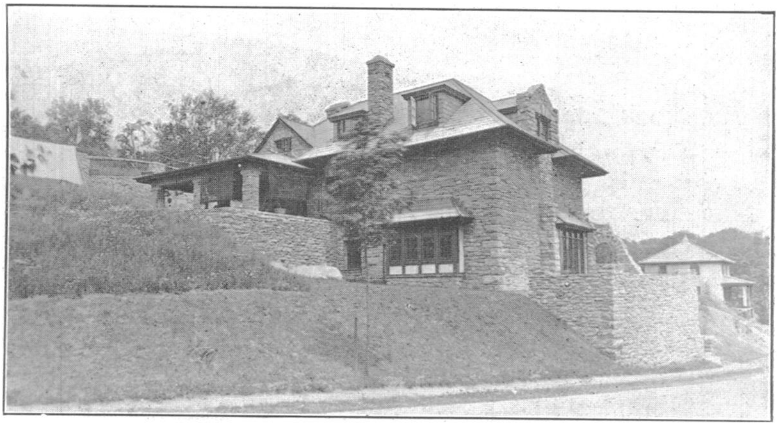
the Virginia mansion. The large manor-house of the South, having spacious, open rooms and wide hall-ways is well adapted to the long heated period. During the past decade the bungalow type of dwelling has become popular in the West. These are usually small, but one story in height, with the rooms so placed that they enclose an open courtyard. The man who first designed this last feature recognized the value of and the universal desire for life in the open. In southern California, where extremes of climate are unknown, the bungalow is little more than four screens, or side-walls, with a roof thrown across the top. Such bungalows, appropriately known as "canary cottages," answer every need for a habitation.

The thoughtful architect also considers climate in determining the height of the dwelling he is planning. Throughout most of the United States the summer half-year is a hot period. For this reason living-rooms and sleeping-rooms are not placed directly underneath the roof in the well-planned home. There is an open air-space above such rooms in the form of a second floor or attic. The cellar floor is usually below the surface of the ground outside, and since cool air is heavier than warm air the cellar is the coolest part of the home during the summer. In the modern dwelling the cellar is utilized for a summer study or workshop, whereas formerly it was little more than a storeroom.

Even in planning the surroundings of a dwelling the architect now considers climate. The typical New England home is surrounded by shade-trees, is often vine-covered, and sometimes is invisible from the road but a few feet distant. As the foliage is absent in the winter, the desired sunshine is then secured, while in summer its shroud of verdure promotes coolness in the dwelling. In the Middle West, trees serve another useful purpose, in that they act as wind-breaks on the level, wind-swept prairies. Every one who has crossed Iowa has observed that a hundred or two hundred feet west of each farm-house is a tall row of trees, planted as close together as they will grow.

The exposure of the dwelling naturally suggests itself next. The climatic features the architect considers in planning the exposure of a contemplated structure are sunshine, wind and rain. Each of these factors deserves consideration.

Sunshine is the best natural germicide, both for the individual, as well as for his immediate environment. While the tanning of the skin by the sun, which some people strive so hard to secure at the sea-shore during the summer time, is of itself of little or no value, it is good evidence that the individual has spent some little time under healthful conditions. The sun helps him perhaps more than he realizes. Besides being a germicide, sunshine is also a nerve tonic. This is not true in tropical countries, but is true in an intermediate latitude like that of the United States. Moreover, sunshine promotes dryness, particularly when admitted into a building. In home design the ideals to be sought are sunshine which does not glare, and shade without draughts. Generally speaking,



Courtesy of *The National Builder.*

A DWELLING IN BUFFALO, NEW YORK, IN WHICH THE NATIVE LIMESTONE HAS BEEN UTILIZED TO GOOD ADVANTAGE. The wide veranda at the rear serves as a living room during the summer months.

Courtesy of *The National Builder.*

THE PHYSICIAN'S HOME SHOULD BE A MODEL OF HYGIENIC PERFECTION. Here is shown the home of a surgeon dentist which is well adapted as a combined home and office.

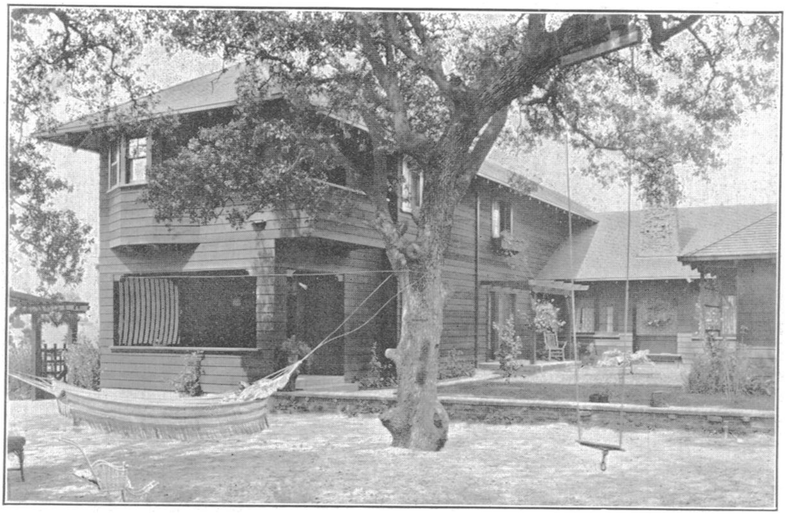
people admit too little sunshine into their homes. Window-curtains are too often lowered when they should be raised. It is less expensive and far more agreeable to replace faded house-furnishings with new ones occasionally than it is to pay doctors' bills. Residents of the West have a saner attitude in this respect than those of the East. In California it is an unpardonable sin to cut off the sunshine in a building. On the other hand, the Indiana novelist usually describes a home as a house with green shutters.

Wind and rain are climatic factors also to be considered by the architect. Throughout the greater part of the United States the prevailing winds are from the west. Northerly winds are cold, southerly winds are warm. The east winds, least frequent of all, are the rain-bearing winds. The undesirable winds are the cold and boisterous winds of the north and west. The desirable winds, warm and gentle, are from the south.

The climatic considerations are alone sufficiently important to determine the ideal exposure of the home. A southern exposure for the living-rooms is best because this gives a maximum of sunshine and a minimum of cold winds. In a hotel the south-facing rooms are in most frequent demand, for obvious reasons. If the living-rooms of a house can not conveniently be arranged to face the south, an eastern exposure is second-best. This gives the rooms the morning sunshine and eliminates the west and north winds. A disadvantage is the fact that the rain usually descends from some easterly point. However, this is not a serious defect in the arrangement, as the total time of rainfall and the persistence of easterly winds is but a small fraction of the year as a whole. As a corollary to these conditions, it might be added that the rooms in which the least amount of time is spent, the dining-room for example, are most advantageously given a northern exposure.

Though anomalous, it is true that the proper exposure of chicken-coops was considered long before that of our homes. Poultrymen long ago built their hen-houses with a south exposure of glass and a northern wall unbroken by a single aperture. Only within a comparatively few years have we thought it important enough to plan our homes with equal care.

The question of exposure suggests consideration of the arrangement of our cities themselves. Every one who has traveled extensively in the United States has observed that the best residence portions of our cities are to the west or the north of the business and manufacturing centers, rarely to the east or south. The aristocratic portion of the city is usually the west or the north side, while the east side has become synonymous with the home of the poor, the "cheap-side." Congested cities and those located on water-fronts do not show this fact conspicuously, but the rule is true of American cities generally. Climatic considerations form but one group of many groups which determine the arrangement of a city. But the east side



Courtesy of *The National Builder.*

THE COURT YARD AT THE REAR OF A PASADENA, CALIFORNIA, BUNGALOW. It is readily apparent why the resident of this dwelling has no doctor's bills to pay. Note the open-air sleeping-porches shown at the left of the picture.

of the city has become the side of lowest real estate value partly because to it the prevailing winds carry the smoke, the dust, the odors and various other excreta of commercial enterprises.

LOCAL CLIMATIC INFLUENCES

The observing traveler can not help but notice local climatic influences on vegetation, on the clothing and the customs of the natives, and, the only matter which concerns us in this discussion, on the architecture. These peculiarities are often observable from a car-window, and may serve to break the monotony of a transcontinental journey. Some conspicuous adaptations of architecture to climate will be enumerated in the following.

Sleeping-porches are a comparatively recent invention. Their increasing use bears witness to the fact that we are wisely paying more and more attention to hygiene. For climatic reasons the sleeping-porch can be used with comfort only during the summer-time in the northern portion of the United States, but elsewhere it can be used to advantage throughout the year. In Los Angeles it is difficult to sell or to rent a dwelling that does not have at least one sleeping-porch.

Courtesy of *The National Builder.*

A DWELLING OF A DESIGN FREQUENTLY ENCOUNTERED IN BOSTON AND IN OTHER NEW ENGLAND CITIES. Well adapted to the extremes and the frequent changes of New England climate.

The screened veranda is also becoming common. It too can be used only during a portion of the year in a large part of the country. But even a limited use serves to satisfy that longing for life in the open. Screens on veranda or window are conspicuously absent on the Pacific Coast, as climatic conditions do not permit the propagation of flies and mosquitoes in large quantities, so screens are unnecessary.

In the Middle West there has been developed an architectural feature known as the summer-kitchen. This is simply a one-room building detached from and immediately to the rear of the dwelling. During midsummer months of almost unbearable heat the family cooking and laundry-work are done in this detached building in order that the dwelling proper may be spared the addition of avoidable heat and odor.

In cities along the Gulf of Mexico in general, and in New Orleans in particular, projecting balconies on the second and third floors are conspicuous. Moreover, the living-rooms of many homes are also on the second or third floors. The climatic significance of these considerations lies in the fact that the ground floor is too damp for comfort and for health. Dryness of floor and air are worth the exertion of stair-climbing. New Orleans is sometimes referred to as the most conservative of American cities. In this particular respect her conservation appears to be well founded on an obvious scientific truth.

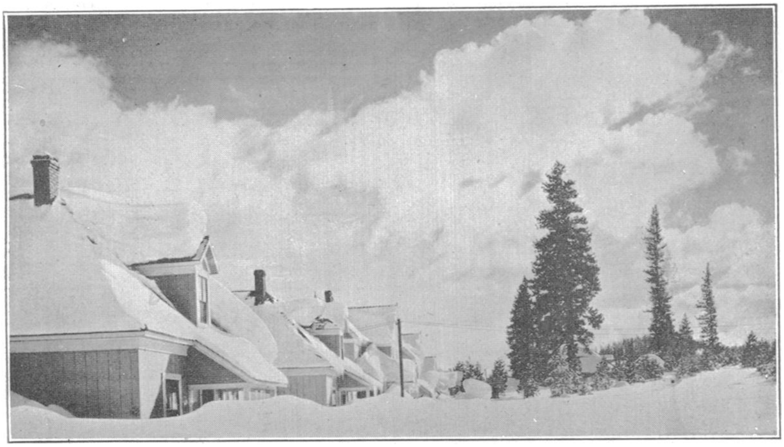
The use of storm-doors and storm-windows is good evidence that severe weather is occasionally experienced. Throughout most of the Middle West and in the northern portion of the Atlantic coast region the winters are so severe that dwellings could not be kept comfortably warm without the use of storm-doors and storm-windows, and, moreover, their use conserves fuel consumption. Along the Great Lakes, as well as along the sea-coast, double windows serve the additional purpose of resisting destructive winds which are sufficiently strong to blow in a single thickness of window-glass. In Minnesota and the Dakotas, where temperatures of twenty to forty degrees below zero occur every winter, the lower portions of the humbler cottages are enclosed with tar-paper or burlap each autumn in order that artificial heat may be retained.

The use of tall smoke-stacks on factories shows climatic influences indirectly. By the use of great height in the chimney an accelerated draught is secured for the fire-box, and, moreover, the gaseous waste-products are expelled sufficiently high in the atmosphere to secure their harmless dispersal. The

Photograph by Fred Rath.

A MODERN DWELLING IN A WINTER SETTING.

tallest smoke-stacks in the United States are those in connection with smelters, where poisonous fumes are thus expelled to best advantage. Furthermore, in planning groups of buildings like universities and civic centers the position of the heating-plant should be determined in large measure by the prevailing direction of the wind. The need for considering this matter in the planning is obvious.



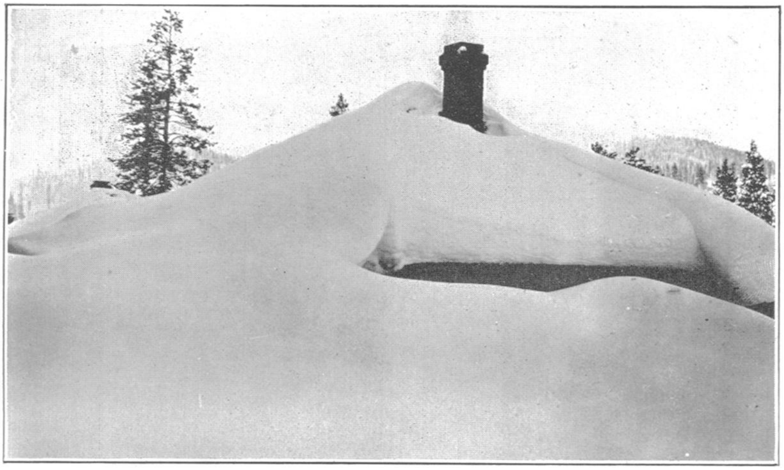
Photograph by Fred Rath.

A JANUARY SCENE IN A VILLAGE LOCATED IN THE HIGH SIERRA NEVADA MOUNTAINS. The need of warm dwellings in such an environment is apparent.

CONDITIONS IN CALIFORNIA

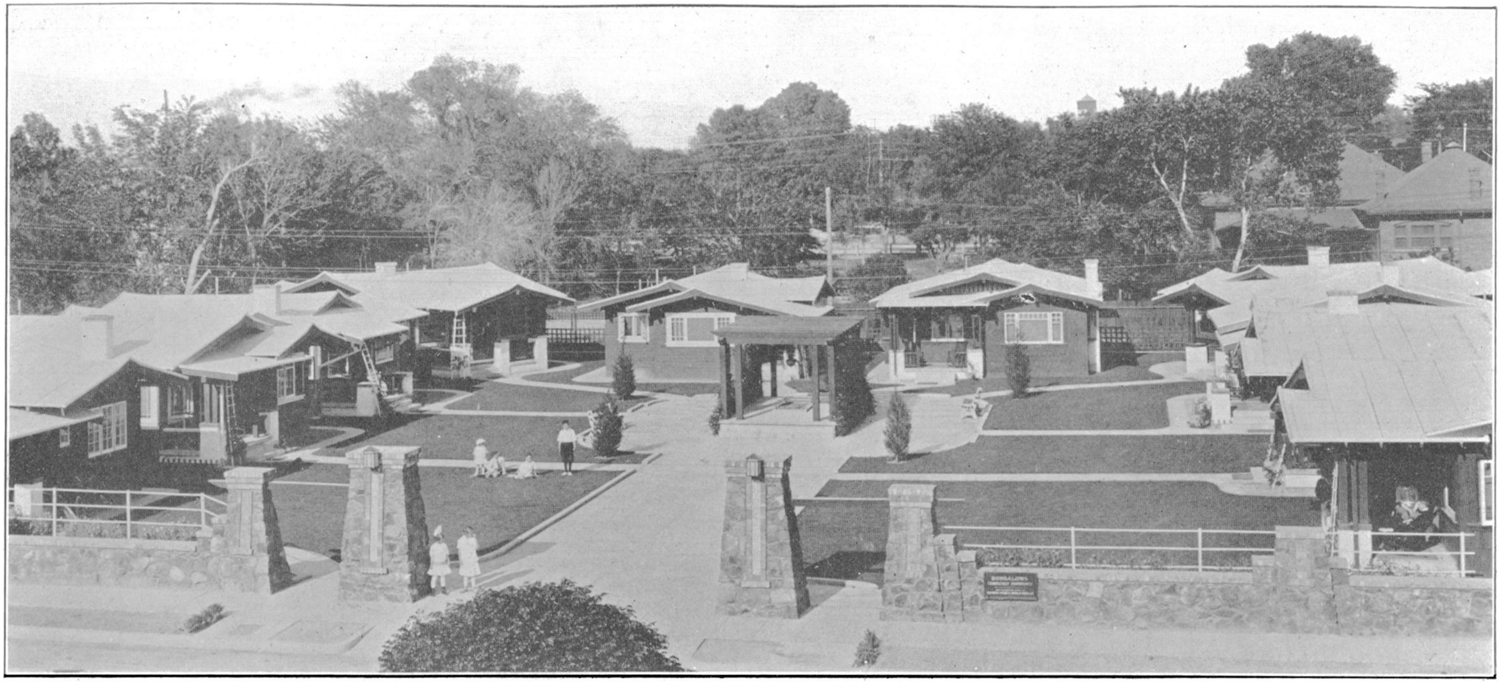
California is the climatologist's paradise. Here within a comparatively limited region one can find an epitome of all the various climates of the United States, besides some climates peculiarly her own. Extremes of climate as well as diminished ranges are exemplified in different parts of this state of infinite variety. For these reasons climatic influences on architecture are readily apparent there. A few of these will be mentioned.

The portion of California which is most densely settled and which is best known in the east has mild temperatures, meager rainfall and few extreme weather conditions. It is therefore a land of the out-doors, and life is largely in the open. At the recent Expositions at San Francisco and San Diego many of the exhibits were out of doors. Art objects of great value were exhibited in the open. The flower-markets of San Francisco are on the sidewalk in winter as well as in summer, and band-concerts are given on Sundays throughout the year in Golden Gate Park. The Greek Theater of the University of California has no roof. The ventilation of moving-picture theatres, a troublesome problem in a large part of the United States, needs no solution in southern California, where there are only a few nights in a whole year when such pictures can not be viewed under starry skies. The waiting-rooms of railway stations are also in the open, with only a roof for protection from sun and



Photograph by Fred Rath.

A COTTAGE SHROUDED IN A MANTLE OF SNOW. Snow is a poor conductor of heat, and a good protector from winds. Such a dwelling may therefore be kept warm in spite of its frigid appearance.



Courtesy of *The National Builder.*

The bungalow Colony Idea is increasing in popularity in the West. Is it any wonder that the death-rate among residents of such a colony is but a small fraction of that which obtains in the tenements along Hester Street, New York, or along Blackhawk Street, Chicago, where more than 2,000 persons live within a single block?

from the occasional shower. Where the sunshine is oppressive, a double roof is constructed so that the air space thus provided may insure cool temperatures in the shade beneath.

CONCLUSION

In this age of efficiency, greater attention is being paid to details than ever before. It appears to be a trait of human nature to consider material and external things first, and personal and internal things last. From the point of view of climate we have long studied the relations of weather to crops. Only recently have we considered its relation to man himself. One phase of the new interest in climatic influences on man himself is that evident in the increased attention being paid in domestic architecture to weather and climate as a condition of environment. The careful architect can not and does not disregard the weather records in planning the most humble bungalow. Considerations of comfort demand that the type of construction, the arrangement of the rooms, the exposure and the heating system, should be adapted to the climate of the region concerned. Considerations of safety demand that the construction shall be made to withstand extremes greater than any which appear in the recent records. Just how large a margin of safety should be provided for is a complex problem, and one whose ultimate solution rests upon an extended weather record for the particular vicinity considered. Matters like these have influenced the design of the home, which, like many other things, has evolved rapidly of late, and is even now in a transition stage. In the well-planned modern home the living-rooms face the south to secure a maximum of sunshine and a minimum of cold and boisterous winds, while the least used rooms are placed to the north, as that is the least desirable exposure, climatically considered. The top-most room, formerly a dusty attic or store-room, has become a sun-parlor. The basement, formerly the laundry or cellar, has become the summer study or work-shop. By a wise dispensation of nature, a comfortable environment is usually a hygienic environment also. Collectively, man has gained much by ceasing to be a nomad. Individually, men are happiest when they live in their own homes. Natural environment determines in large measure the nature of that domicile. Weather conditions are now considered by the conscientious architect in planning the construction of such a dwelling, and the artificial climate which is to be created within it.